Applicants: Haase *et al*
U.S.S.N.: Not Yet Assigned
Title: System and Method for Managing Data associated with Copying and Recovery Procedures in a Data Storage Environment
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Attorney: Robert Kevin Perkins. Esq. (Reg. No. 36,634)
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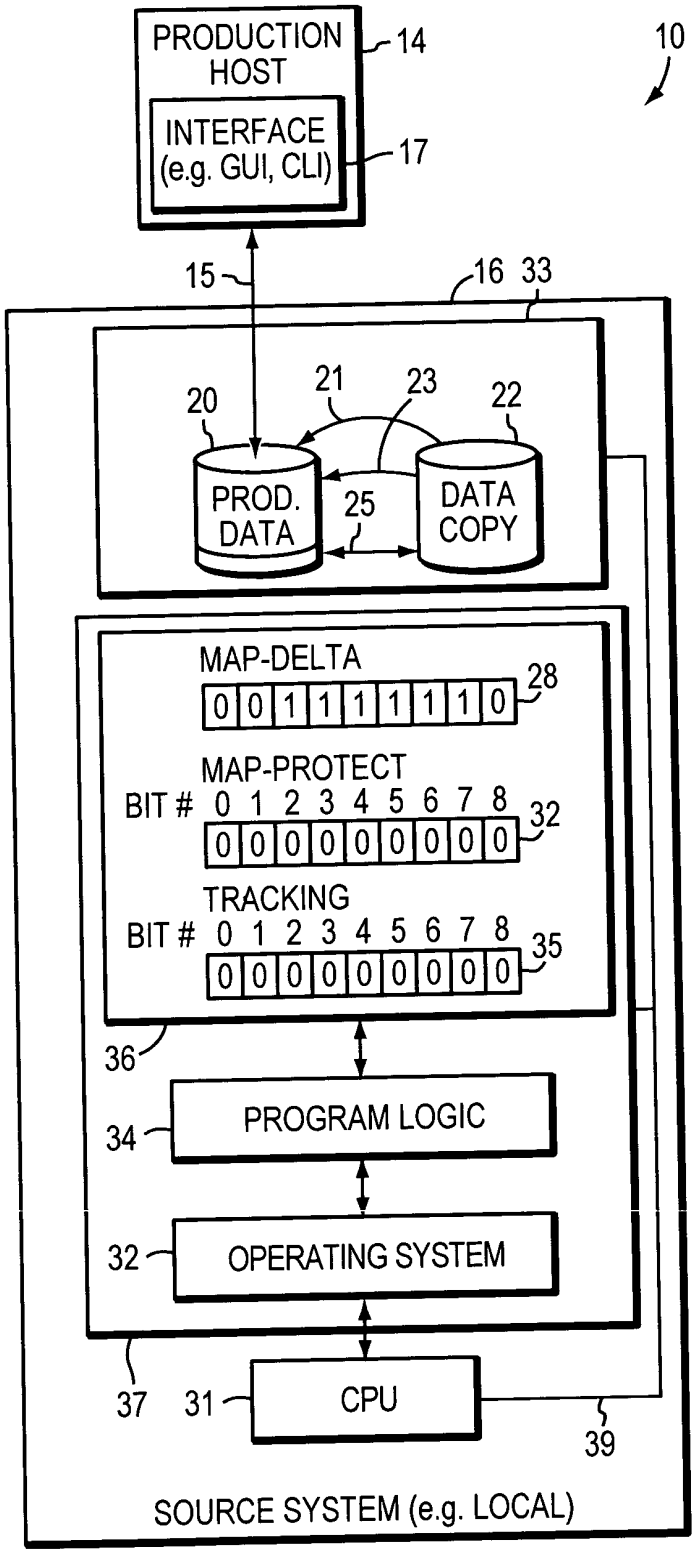

FIG. 1

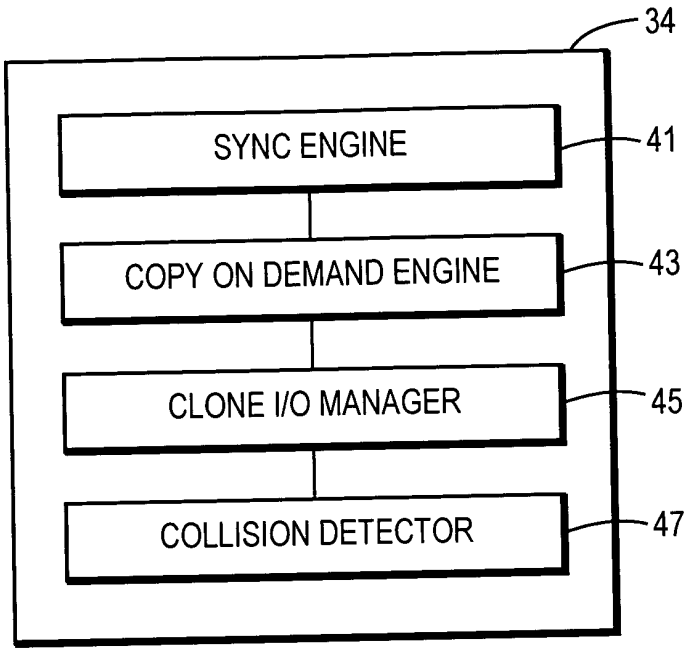
34
SYNC ENGINE
41
COPY ON DEMAND ENGINE
43
CLONE I/O MANAGER
45
COLLISION DETECTOR
47

FIG. 2

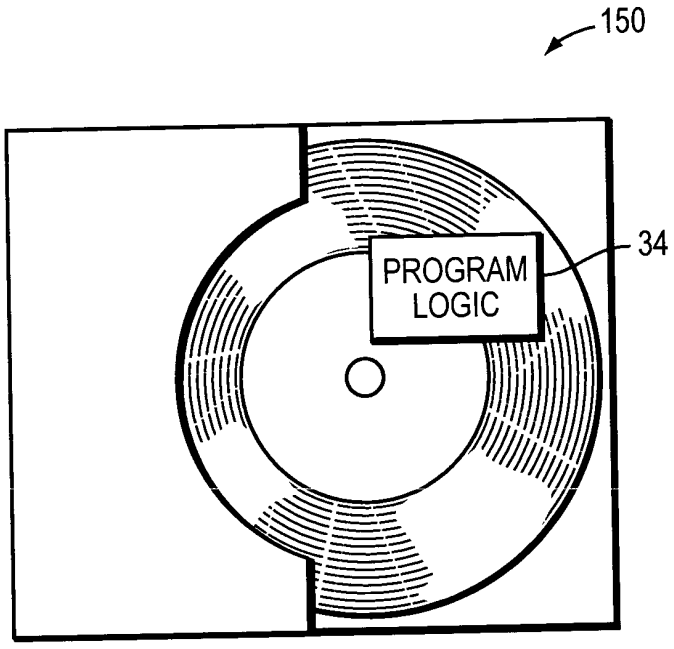
150
PROGRAM LOGIC
34

FIG. 3

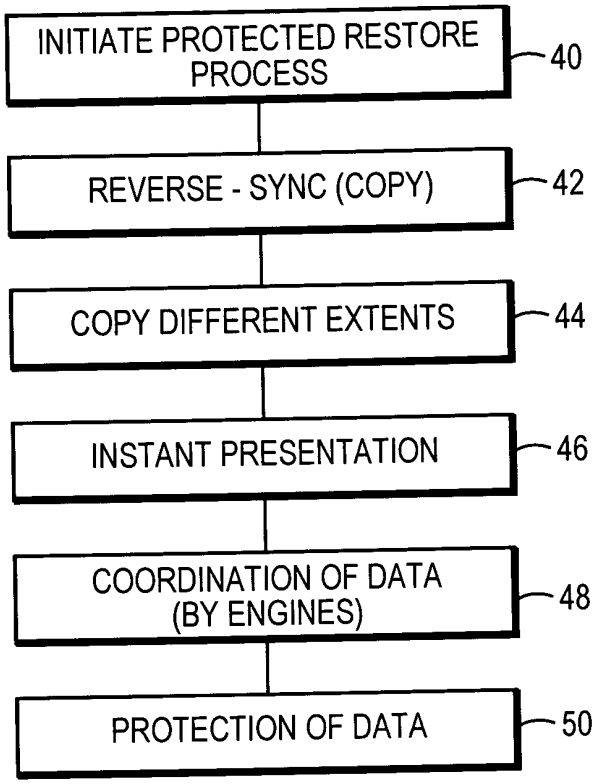
INITIATE PROTECTED RESTORE PROCESS
40
REVERSE - SYNC (COPY)
42
COPY DIFFERENT EXTENTS
44
INSTANT PRESENTATION
46
COORDINATION OF DATA (BY ENGINES)
48
PROTECTION OF DATA
50

FIG. 4

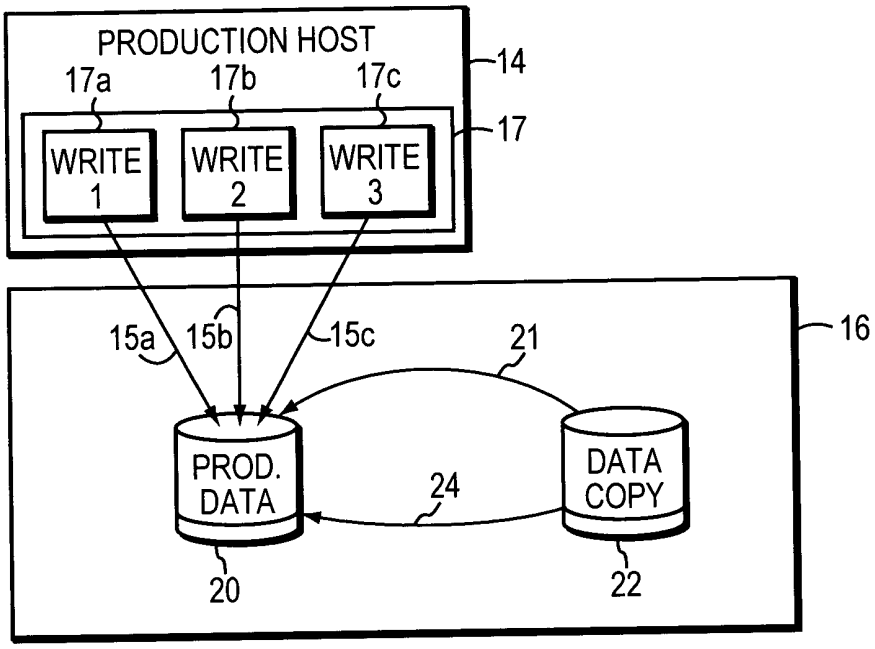
PRODUCTION HOST
14
17a
17b
17c
17
WRITE 1
WRITE 2
WRITE 3
15a
15b
15c
21
16
PROD. DATA
DATA COPY
24
20
22

FIG. 5

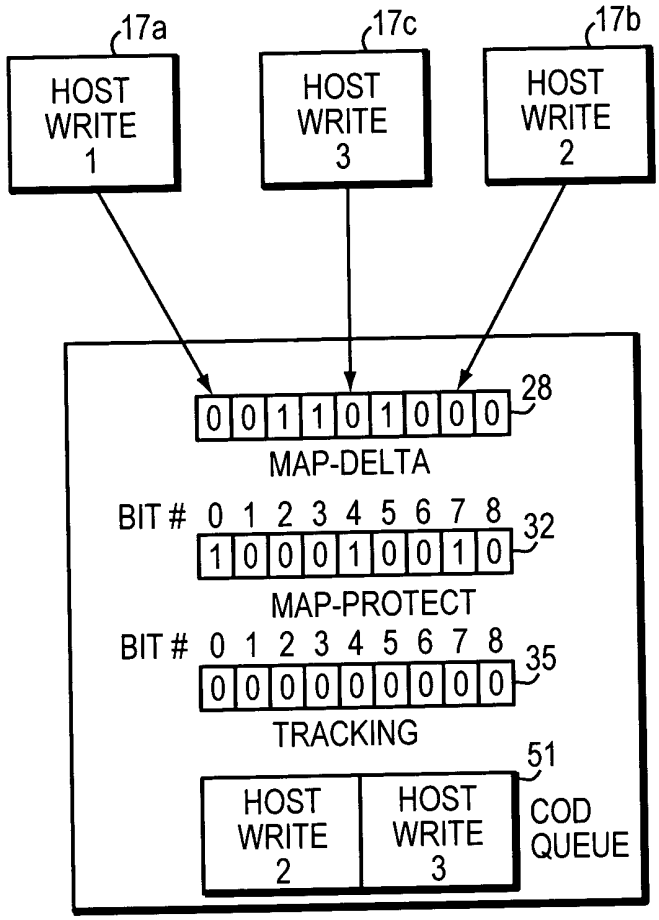
17a
17c
17b
HOST WRITE 1
HOST WRITE 3
HOST WRITE 2
0 0 1 1 0 1 0 0 0
28
MAP-DELTA
BIT # 0 1 2 3 4 5 6 7 8
1 0 0 0 1 0 0 1 0
32
MAP-PROTECT
BIT # 0 1 2 3 4 5 6 7 8
0 0 0 0 0 0 0 0 0
35
TRACKING
51
HOST WRITE 2
HOST WRITE 3
COD QUEUE

FIG. 6

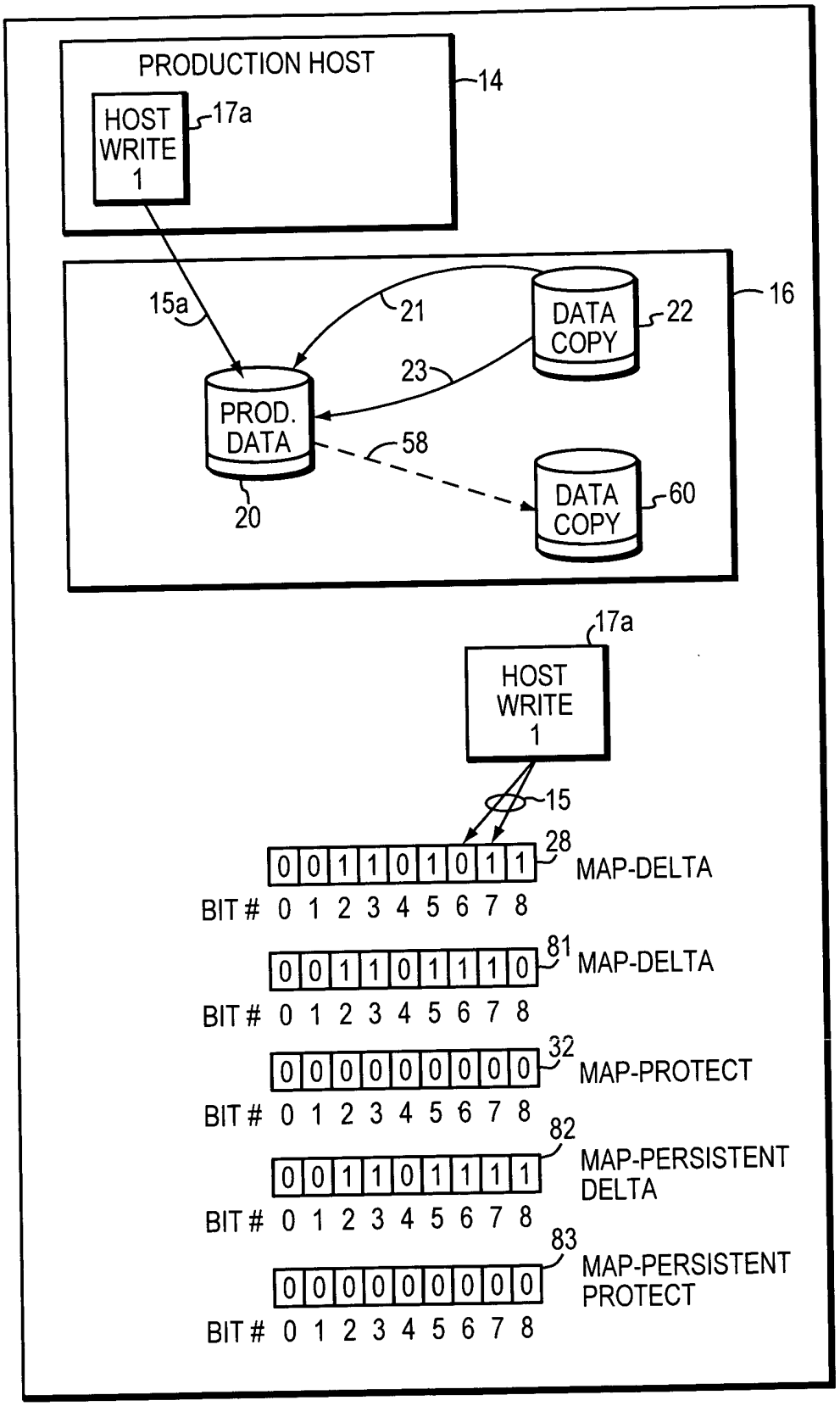
PRODUCTION HOST
14
HOST WRITE 1
17a
15a
21
DATA COPY
22
16
23
PROD. DATA
58
DATA COPY
60
20
17a
HOST WRITE 1
15
28
0 0 1 1 0 1 0 1 1
MAP-DELTA
BIT # 0 1 2 3 4 5 6 7 8
81
0 0 1 1 0 1 1 1 0
MAP-DELTA
BIT # 0 1 2 3 4 5 6 7 8
32
0 0 0 0 0 0 0 0 0
MAP-PROTECT
BIT # 0 1 2 3 4 5 6 7 8
82
0 0 1 1 0 1 1 1 1
MAP-PERSISTENT DELTA
BIT # 0 1 2 3 4 5 6 7 8
83
0 0 0 0 0 0 0 0 0
MAP-PERSISTENT PROTECT
BIT # 0 1 2 3 4 5 6 7 8

FIG. 7

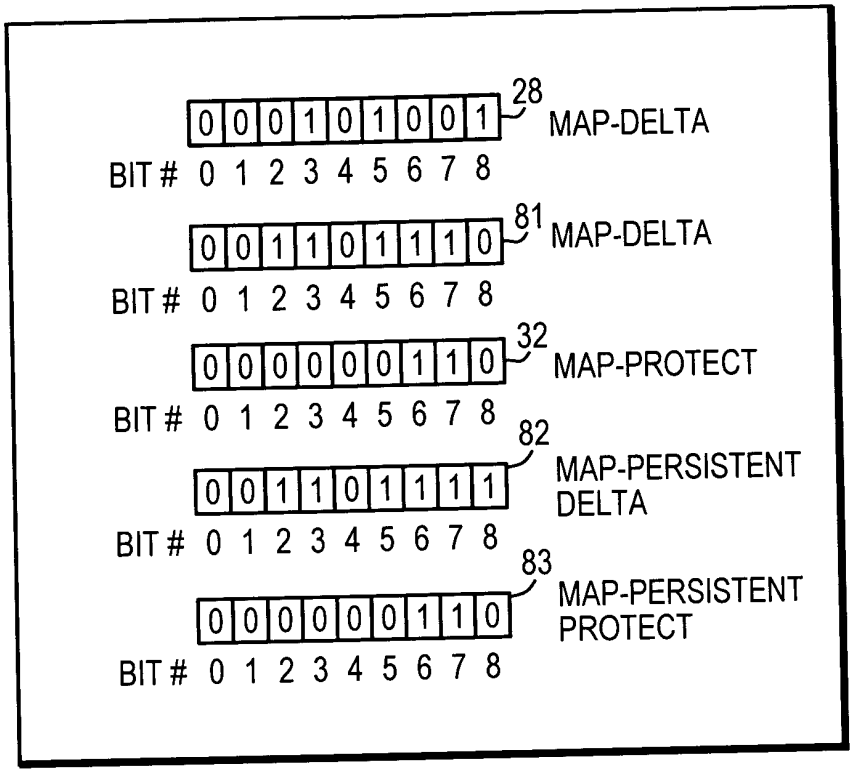
0 0 0 1 0 1 0 0 1
28
MAP-DELTA
BIT # 0 1 2 3 4 5 6 7 8
0 0 1 1 0 1 1 1 0
81
MAP-DELTA
BIT # 0 1 2 3 4 5 6 7 8
0 0 0 0 0 0 1 1 0
32
MAP-PROTECT
BIT # 0 1 2 3 4 5 6 7 8
0 0 1 1 0 1 1 1 1
82
MAP-PERSISTENT DELTA
BIT # 0 1 2 3 4 5 6 7 8
0 0 0 0 0 0 1 1 0
83
MAP-PERSISTENT PROTECT
BIT # 0 1 2 3 4 5 6 7 8

FIG. 8

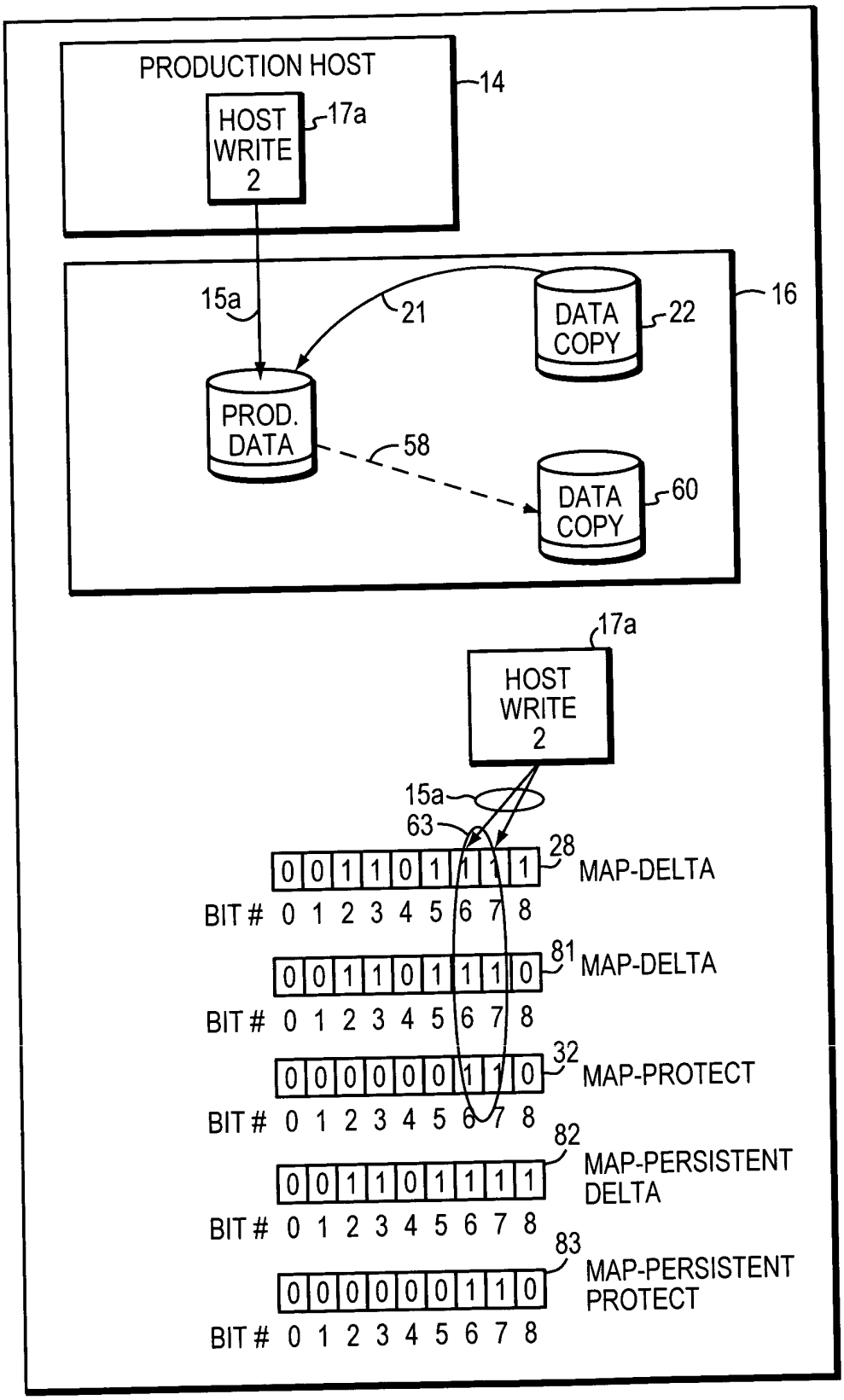
PRODUCTION HOST
14
HOST WRITE 2
17a
15a
21
DATA COPY
22
16
PROD. DATA
58
DATA COPY
60
17a
HOST WRITE 2
15a
63
28
0 0 1 1 0 1 1 1 1
MAP-DELTA
BIT # 0 1 2 3 4 5 6 7 8
81
0 0 1 1 0 1 1 1 0
MAP-DELTA
BIT # 0 1 2 3 4 5 6 7 8
32
0 0 0 0 0 0 1 1 0
MAP-PROTECT
BIT # 0 1 2 3 4 5 6 7 8
82
0 0 1 1 0 1 1 1 1
MAP-PERSISTENT DELTA
BIT # 0 1 2 3 4 5 6 7 8
83
0 0 0 0 0 0 1 1 0
MAP-PERSISTENT PROTECT
BIT # 0 1 2 3 4 5 6 7 8

FIG. 9

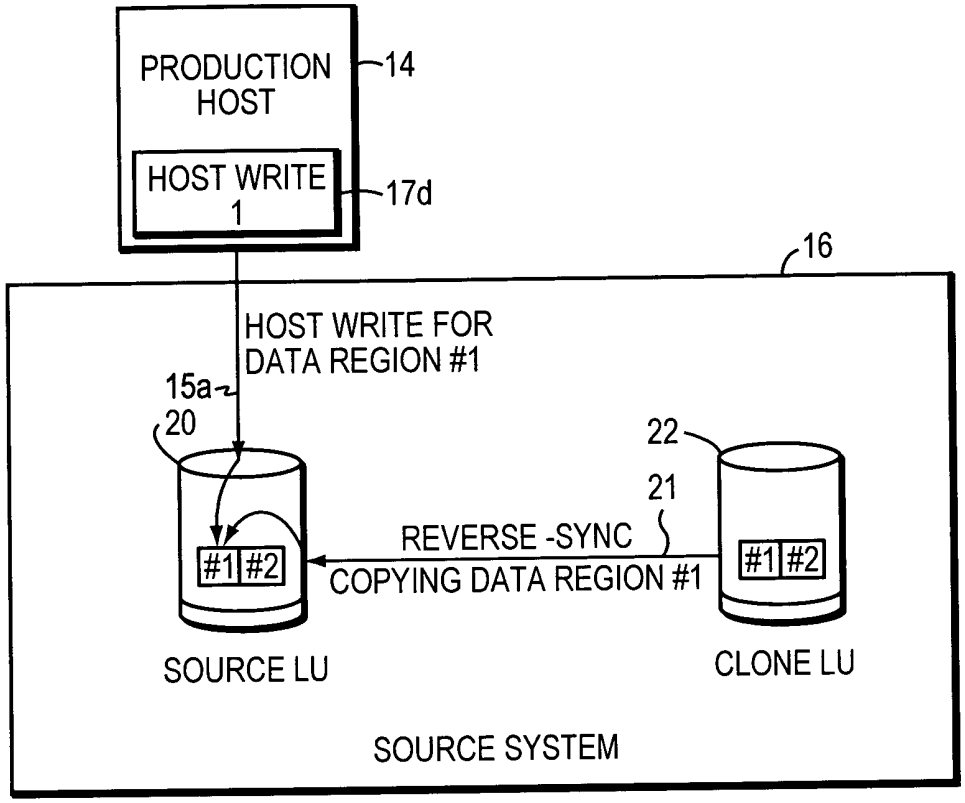
PRODUCTION HOST
14
HOST WRITE 1
17d
16
HOST WRITE FOR DATA REGION #1
15a
20
22
21
REVERSE -SYNC
COPYING DATA REGION #1
#1 #2
#1 #2
SOURCE LU
CLONE LU
SOURCE SYSTEM

FIG. 10

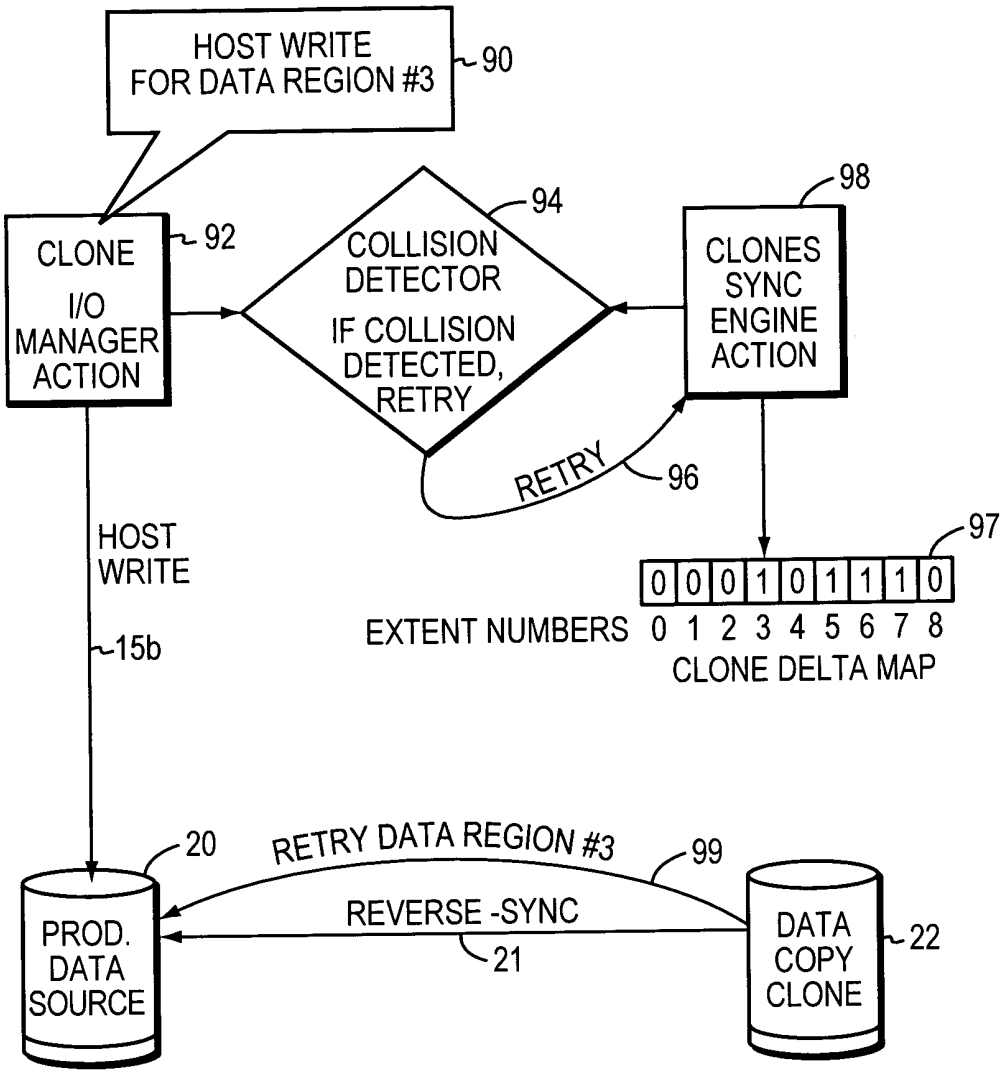
HOST WRITE FOR DATA REGION #3
90
CLONE I/O MANAGER ACTION
92
COLLISION DETECTOR
IF COLLISION DETECTED, RETRY
94
CLONES SYNC ENGINE ACTION
98
RETRY
96
HOST WRITE
15b
0 0 0 1 0 1 1 1 0
97
EXTENT NUMBERS 0 1 2 3 4 5 6 7 8
CLONE DELTA MAP
20
RETRY DATA REGION #3
99
REVERSE -SYNC
21
PROD. DATA SOURCE
DATA COPY CLONE
22

FIG. 11